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The DoD managed care initiative, TRICARE, brings with it many changes as it becomes fully implemented. This retrospective study examined the effect of TRICARE on emergency room (ER) utilization at a 116-bed Army medical treatment facility (MTF) which operates a Level II ER. Two convenience samples of patient records were examined. One sample, the pre-TRICARE group (n=518), consisted of patients using the ER during a nine-day period in 1995 while the other sample, the post-TRICARE group (n=410), consisted of patients using the ER during a comparable nine-day period in 1996. The results demonstrate that ER utilization varied as a function of TRICARE with a 20.8 percent decrease in patient volume and a 27.7 percent drop in nonurgent use. Thirteen categorical variables were extracted from ER records and further sub-categorized into 59 study variables. THe groups were compared, variable by variable, for any differences using a student's t-test. A total of eleven sub-category variables were statistically signifcant at the $p < .05$ level. Stepwise multiple regression analysis yielded an R-square of .23 for each group in analyzing nonurgent use.

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A Comparative Analysis of Emergency Room Utilization Before and After TRICARE Implementation At Reynolds Army Community Hospital Fort Sill, Oklahoma

A Graduate Management Project

Submitted to the Faculty of

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In Partial Fulfilment of the

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of

Master of Health Administration

By

Major James M. Gamerl, CHE

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I am forever grateful for the three things which have made the last two years possible: family, friends, and faith.

My family -- Cindy, Justin, and Jessica -- endured this demanding period and put up with hardships I should not have put them through. I know it was not easy. Thanks for your understanding and support.

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Finally, to the Lord and my faith, which sustained me through the highs and lows of this experience, I give eternal thanks. "For the Lord did not give us a spirit of timidity, but one of strength, and of love, and of self-discipline." 2 Timothy 1:7.

ABSTRACT

The Department of Defense (DoD) managed care initiative, TRICARE, brings with it many change as it becomes fully implemented. This retrospective study examined the effect of TRICARE on emergency room (ER) utilization at a 116-bed Army medical treatment facility (MTF) which operates a Level II ER. Two convenience samples of patients were examined. One sample, the pre-TRICARE group (n = 518), consisted of patients using the ER during a nine-day period in 1995 while the other sample, the post-TRICARE group (n = 410), consisted of patients using the ER during a comparable nine-day period in 1996. The results demonstrate that ER utilization varied as a function of TRICARE with a 20.8 percent decrease in patient volume and a 27.7 percent drop in nonurgent use.

Thirteen categorical variables were extracted from ER records and further sub-categorized into a total of 59 study variables. The groups were compared, variable-by-variable, for any differences using a student's t-test to measure the magnitude and direction of any change. A total of eleven sub-category variables were statistically significant at the $p < .05$ level.

Stepwise multiple regression analysis was used to determine which variables made a statistically significant contribution to nonurgent ER use, the dependent variable, in each group. Each regression model accounted for about 23 percent of the variance associated with nonurgent ER use. The modest predictive efficiency of each model was very statistically significant.

The study results indicate that a managed care environment such as TRICARE can have a positive effect on ER use by decreasing both volume and nonurgent use.

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INTRODUCTION

Background Information

The hospital emergency room/emergency department (ER/ED) is coming under closer scrutiny as managed care continues to proliferate the nation unabated. The costs of services provided here are a major concern for those organizations that choose to operate an ER/ED. In announcing his proposed health care reform plan to the nation, President Bill Clinton referred to the emergency department as "the most expensive place of all" (Clinton, 1993). Visits to hospital ERs/EDs continue to increase. In 1993, the General Accounting Office (GAO) reported that ED use had increased by 19 percent from 1985 to 1990, with 99.6 million visits to EDs in 1990 (GAO, 1993). It is widely believed that about half of all visits to ERs are for minor medical problems and that the cost of a nonurgent visit is about triple the cost of a visit to a physician's office (McNamara and Hand, 1994; Public Health Service, 1994). This seemingly inefficient use of resources defies explanation, particularly in a managed care environment which professes cost containment, efficiency, and tight management controls.

Reynolds Army Community Hospital (RACH), Fort Sill, Oklahoma is a small, 116-bed medical department activity (MEDDAC) located in rural southwest Oklahoma. Among the many services provided to its beneficiary population of about 52,000 are emergency services. Reynolds operates a level II ER, staffed to operate 24 hours per day. Like any military treatment facility (MTF) providing this service, RACH is painfully aware of the amount of dissatisfaction patients can experience during a lengthy wait in an overcrowded room (RACH Patient Representative Office, 1995). Reynolds grapples with

the challenge of providing prompt, quality, and appropriate emergency medical care to those who need it while trying to educate beneficiaries about alternatives to an ER visit.

In fiscal year (FY) 1995, Reynolds experienced 372,618 outpatient visits with 23,500, or 6.3 percent, being ER visits. Direct expenses for the ER totaled $2.65 million resulting in an average cost per visit of $123.38 (RACH Medical Expense and Performance Reporting System [MEPRS], 1995). Data on acuity level of patients was not readily available, but anecdotal information from the ER staff indicated that the vast majority of patients used the ER for nonurgent conditions (Schossler, 1995). A close examination of ER use had not been conducted in many years, and with the prospect of TRICARE looming near, it seemed an opportune moment to gather empirical data in an attempt to understand who uses the ER and the magnitude of nonurgent use.

Reynolds' ER is often used as a means of obtaining access to care. Notable is the co-location of the Minor Care Clinic which is used as the "ER Fast Track" for those patients triaged as category 3 (nonurgent). The concept of "fast tracking" will be covered in greater detail during the literature review. The Minor Care Clinic, which saw 28,818 patient visits in FY 95, or 7.7 percent of all outpatient visits, operates from 0800 hours to midnight each day. When it closes, all patients are treated by the ER staff, including category 3 patients. The ER staff has a stated goal of having every patient seen by a provider within two hours of arriving (Knapp, 1996). This standard can be difficult to achieve during times when patient volume is especially high.

Nonurgent use and what to do about it is a major concern for any managed care

organization (MCO). Some use the term "inappropriate" to describe nonurgent use of the ER (Gibson, 1977; Buesching et al., 1985; Derlet et al., 1992; Gill, 1994). The accuracy of this term is still being debated, however. Some argue that it is an oversimplification to view emergency room use as appropriate or inappropriate (Haddy et al., 1987). Powers et al. (1983) studied numerous factors in emergency room utilization and state that "...from the patients' perspective, their emergency room use was appropriate because they thought their symptoms were serious." Further, ER use for some complaints, such as chest pain, can only be judged appropriate or inappropriate retrospectively. If the patient was in fact experiencing a life-threatening cardiac episode, the use would be appropriate whereas if it were found to be simple pain of the musculoskelatal chest wall, the use might be considered inappropriate. Accordingly, this study uses the term nonurgent and leaves the appropriateness or inappropriateness of such utilization for further debate. Diverting nonurgent users of the ER to more suitable, less expensive primary care settings makes good clinical and fiscal sense. Moreover, it frees up the ER staff to treat those with true medical emergencies. In today's increasingly competitive health are environment, balancing the need to provide emergency services without making it attractive to those who do not actually require the service is a challenge for any health care provider, administrator, or manager.

Conditions Which Prompted the Study

Reynolds is no stranger to managed care, having been a Catchment Area Management (CAM) demonstration site in 1988 and fully implementing the Army's managed care initiative, the Gateway to Care program, in 1992. The valuable insight and

experience gained during these programs served the organization well as the Congressionally-mandated Department of Defense (DoD) managed care program, TRICARE, was implemented at Reynolds on 1 November 1995. Implementation of TRICARE is expected to alter how military treatment facilities deliver health care by adopting and adhering strictly to the tenets and principles of managed care.

Under the TRICARE program, Reynolds becomes a staff model health maintenance organization (HMO) and seeks to enroll eligible beneficiaries into the HMO under the option termed TRICARE Prime. Some significant changes have already occurred as a result of implementing TRICARE. First, the population Reynolds serves under TRICARE Prime changed because Medicare-eligible beneficiaries are not eligible to enroll in TRICARE Prime. Reynolds continues to see some patients in this category on a space-available basis for primary and specialty care, but certainly not at pre-TRICARE levels. The ER remains an open portal of entry for these patients to access health care services at RACH. Second, a number of initiatives associated with TRICARE implementation are expected to increase access to primary care for TRICARE Prime enrollees. Standards for access to urgent, routine, and specialty care are mandated under the TRICARE program. These two changes are thought to considerably alter how many of Reynolds' services are utilized.

One of the services expected to be affected by TRICARE is the ER. During initial planning for TRICARE implementation it became evident the ER may still provide non-Prime enrollees with direct access to health care at Reynolds. The key leadership of Reynolds is keenly interested in what change, if any, occurs in ER utilization after

TRICARE is fully implemented. Because of its link with primary care, the manner in which the ER is used provides a useful gauge of the organization's primary care delivery effectiveness. The data which can be collected from a research effort involving the ER can therefore be quite useful. This is a compelling reason for closely examining the ER.

Statement of the Problem and Questions

The problem in this study is to determine the effect of TRICARE on utilization of the ER. Two questions can help ascertain TRICARE's impact. First, does ER utilization change in a TRICARE environment? Second, are there predictive factors which influence how nonurgent use of the ER is impacted pre- and post-TRICARE implementation?

Literature Review

There are numerous current references in the health care administration literature that address the wide spectrum of ER issues. While the sources reviewed herein cover a range of ER issues, the focus of this review will be on ER utilization and the impact of managed care. The literature review begins with an overview of characteristics and determinants of ER use. The focus then shifts to reviewing managed care's impact on ER services and concludes with an examination of efforts and strategies to reduce nonurgent use of the ER.

Characteristics and Determinants of ER Utilization. Padgett and Brodsky (1992) report that hospital ERs play three major roles in health care delivery, functioning as: (1) trauma centers; (2) a source of emergency care for individuals with sudden and serious illness; and (3) physician substitutes when private care is not available. A recent

comprehensive study by the General Accounting Office (GAO) revealed that of the nearly 100 million ER visits in 1990, only 17 percent were assessed as actual emergent conditions (GAO, 1993). The same study also reports that about 14.6 percent of patients entering the ER required hospital admission (GAO, 1993). Thus the third role, as physician substitute when private care is not available, appears to have great relevance. This role is a major contributor to the ever-growing problem of ER overcrowding and lengthy waits associated with receiving care in the ER (Stock et al., 1994). Interestingly, while the problems of ER overcrowding and long waits are ever-growing, they are not recent phenomena as research concerning them first surfaced in *The Lancet* in 1869 (Tilt, 1869).

Nonurgent use of the ER accounts for approximately 43 percent of ER visits (GAO, 1993), with some studies placing it as high as 65 to 75 percent (Baker et al., 1991; Schesser et al., 1991). The most frequent reason cited by many studies for the increased nonurgent use is that patients do not have a primary health care provider (Schesser et al., 1991; Padgett and Brodsky, 1992; Baker et al., 1994; Baker et al., 1995; GAO, 1993). Buesching et al. (1985) found that subgroups with the highest incidence of nonurgent ER use included: children 5 years and younger, those unable to identify a personal or primary care physician, those patients failing to contact their primary care physician, and unemployed persons. The issue of nonurgent care provided in the ER and its correlation with lack of primary care is not unique to the United States. Even in countries with universal health coverage such as Canada and Britain, researchers report this same

phenomenon (Wood and Cliff, 1986; Foroughi and Chadwick 1991; Walsh 1990; Rund et al., 1992; Davison et al., 1983).

Baker et al. (1995) found that the vast majority of patients regarded the ER as their regular source of care and believed it was appropriate to seek care there for routine medical problems. Pisarcik (1990) offers some explanation for this outlook toward the ER as one's primary source of care. Her study found that expediency and immediacy of care were most cited as reasons for seeking care at the ER. This included the convenience of the ER's operating hours (usually 24 hours per day), the ability to receive diagnosis and treatment in one contained area (the "one-stop-shopping" mentality), no requirement to go through an appointment system, and lack of knowledge about alternative care. Proximity is also noted to be an influence in ER use (Roghmann and Zastowny, 1979; Magnusson, 1980; Beland et al., 1990; Buesching et al., 1985). Those residing in the same census tract as the ER tend to use it more frequently than persons living in more distant tracts. Thus, the convenience and accessibility hospital ERs afford appear to be powerful incentives to their use. Though medical attention in the ER may entail a considerable wait in a crowded room, medical care is eventually available and rarely refused (Baker et al., 1994).

It has been consistently demonstrated that men and women differ in health status and illness behavior (Andersen and Newman, 1973; Andersen and Aday, 1986). This is thought to affect utilization of the ER although there is not consensus on this point. Most studies conclude that females use the ER more frequently than males (Baker et al., 1994; Baker et al., 1995; Rachliss 1993; Lehmann et al., 1994; Afialo et al., 1995).

Others challenge this conclusion and offer diverging opinions. Some studies have found that men are more frequent users of the ER (Anson et al., 1991; Schesser et al., 1991) while others report no differences in use of the ER based on gender (Andren and Rosenquist, 1987; Kooiman et al., 1989). Inconsistencies in findings relative to differences between gender and ER use are likely the result of the demographics of the general population in the geographic study area.

Age is thought to be another factor associated with ER use. Most studies report that those in age group 18-40 use the ER most frequently (Schesser et al., 1991; Anson et al., 1991) while many studies report the mean age of the ER patient to be between 33 and 37 years of age (Weissberg et al., 1986; Bindman et al., 1991; Baker et al., 1991). Again, the distributions reported among the studies are likely to be a result of demographics of the general population in the geographic study area. Brown and Goel (1994) report an interesting variation from the majority of age-related studies. They report a U-shaped distribution by age among ER users with the highest proportion of ER use in the youngest (0 to 5 years) and the oldest (75 years and older) age groups.

The variable of *when* patients present -- day of the week and hour of the day -- is considered another influence on ER usage. Research indicates that ER use increases during the weekend (Walsh 1990; MacKoul et al. 1995; Lehmann et al., 1994; Tandberg and Qualis, 1994). This typically correlates with inability to obtain care during the week due to other demands experienced by many working adults (Meditz et al., 1992; Pachter et al., 1991). As for time, most studies conclude that the majority of ER patients generally present between the hours of 3:00 p.m. and midnight (Gibson, 1977; Gibson et

al., 1978; Ettinger et al., 1987; Williams, 1991; Tandberg and Qualis, 1994). In assessing demand for emergency services, the variable of *when* is a crucial factor in determining optimum operating hours and setting staff schedules.

Service times associated with ER use are coming under closer scrutiny. Consumers are demanding faster service and the health care market is beginning to respond. *The Wall Street Journal* recently reported about a New Jersey hospital that promises emergency room patients prompt service or it pays their bill (WSJ, 1995). Lengthy waits are demonstrated to correlate with ER patients who leave without being seen (LWBS), low patient satisfaction ratings, and a perceived lower level of quality health care being delivered (Fernandes et al., 1994; Stock et al., 1994; Baker et al., 1991)

Patients who leave without being seen by a provider present an increasingly troubling problem for emergency medicine physicians. Their competency and informed consent become critical issues in the determination of physician liability should subsequent damages result from the LWBS course of action undertaken by the patient (Sainsbury, 1990). This is especially true if the patient-physician relationship is considered to be established upon the patient presenting for treatment. Thus, the ER must balance quality of care with its ability to provide prompt service to many people while avoiding costly potential litigation that may arise from LWBS patients.

Managed Care's Impact on ER Use. Managed care's primary focus is on primary care and preventive services (Kongstvedt, 1993) and, by using the gatekeeper concept, better control of referrals to specialty services. Emphasizing wellness and primary care coupled with close scrutinization of referrals are cost-containment strategies central to any

managed care effort. Health care delivered in the ER is documented to be among the most expensive of all outpatient visits (DeKeyser et al., 1994; O'Grady et al., 1985), with costs varying significantly by geographic region. O'Grady et al. (1985), using a six-region comparative analysis design, found that the average *charge* (vice cost) per ER patient ranged from $105 to $348 (in 1985 dollars). In a study of six community hospitals in Michigan, Williams (1996) reports that the average cost of an ER visit was $209, while the average *charge* was $383. Clearly, the cost associated with providing emergency services warrants close scrutiny by budget-minded managers (Baker and Baker, 1994). Thus, the ER and how it is utilized is of keen financial interest to health care organizations, and particularly to MCOs.

To examine the impact managed care has upon ER use, the state of Tennessee offers some valuable insight. In 1994, Tennessee implemented a statewide health care reform initiative called TennCare (Mirvis et al., 1995). The objective of TennCare is to control the rapidly rising costs of the state's Medicaid program and extend health insurance coverage to most Tennesseans without access to employer-sponsored or other government-sponsored health insurance. TennCare consists of twelve MCOs who receive a per member per month (capitated) dollar amount to provide the necessary care to enrolled beneficiaries. The MCOs, in turn, negotiate contracts for services with providers to deliver the health care. At the end of its first year, more than 1.2 million citizens were enrolled in TennCare.

TennCare's impact on ER use is mixed. Some ERs report a decrease in volume of patients while others have seen an increase, particularly in nonurgent visits (Hulen and

Beesler, 1995). These volume changes seem to be directly proportional to the number of MCOs in which hospitals participate. Curry (1994) reports that a number of participating hospitals experienced a dramatic decrease in nonurgent ER visits and were able to close their ER fast tracks and acute minor care clinics. Most of these hospitals attribute the decrease in nonurgent use with a notable increase in access to primary care for TennCare enrollees. Still others report a surge in ER volume, driven mostly by nonurgent visits, that led to the development and implementation of ambulatory care centers (Hulen and Beesler, 1995). It appears that the decreases in overall use and nonurgent use by some ERs were offset by increases in both categories by other ERs. The definitive impact of TennCare on ER use will likely become clear in the next few years as the state gains more experience with managed care and more data becomes available.

New Jersey is another state with a large-scale health care reform initiative employing managed care. In the December 1993 edition of *Journal of Emergency Nursing*, Violetta Ayalon, clinical coordinator for a large metropolitan hospital in Newark, reports the positive influence managed care has had on chronic ER overcrowding. The focus on primary care, particularly for those patients who demonstrated difficulty in obtaining primary care, has increased access to care for their patients. This has helped to decrease the volume of patients seen in the ER and, more importantly, diverted patients away from the high-tech, expensive resources consumed during an ER visit. Directing these patients into less expensive outpatient settings in providers' offices is beneficial for the patient as well because of the continuity of care it permits.

The Maryland Access to Care (MAC) is another example of a statewide health care reform initiative adopting the tenets of managed care. This program enrolls Maryland's Medicaid population into MCOs, improving access to primary care and preventive services (Gadmoski et al., 1995). The MAC program adopts a strict gatekeeping approach and requires patients to obtain authorization from their primary care provider prior to being seen in a hospital emergency department. This practice reduced the number of Medicaid patients using the ER for nonurgent care. In adopting this stringent approach to ER use, MAC experienced some adverse outcomes, two of which resulted in preventable deaths. This caused the state to cease gatekeeping procedures for controlling access to hospital ERs. These tragic outcomes serve as a stark reminder for MCOs who seek to withhold or limit care in cases where care is clearly required to be rendered.

Managed care, though prevalent across the nation, is still a fairly new approach to health care delivery on a large scale. There is a definite lack of conclusive research about managed care's specific impact on ER utilization. The data that is available suggests that ER use in a managed care environment changes differently from region to region and differently from facility to facility within each region. As managed care continues to proliferate the health care industry, more research about how it specifically affects ER usage is likely to emerge.

Strategies to Reduce Nonurgent Use of the ER. Nonurgent use of the ER is a growing concern for most health care organizations today. Accessible emergency care and the increased cost of providing nonurgent care (Baker and Baker, 1994) and the dilemma of providing this valuable service without making it attractive to those who do not need it

(Kellermann, 1994), is forcing health care organizations across the nation to explore a variety of alternative strategies to mitigate this problem. The literature offers some creative ways to reduce nonurgent use of the ER.

Logically, in order to divert nonurgent patients, they must first be identified. An effective triage system is therefore a very key ingredient in distinguishing patients. Triage of patients is designed to ensure that the most seriously ill or injured patients receive care first (Brillman et al., 1996). Patients are prioritized by the severity of their illness or injury relative to that of other patients who are waiting for medical care, regardless of the order of arrival. This vital first step in any ER visit, then, provides the data necessary to further analyze ER users.

There is a growing consensus in the health care industry that triage need not occur in the ER (Richards, 1995; Kunkler, 1994; Molyneux et al., 1994). Many health care organizations use a telephone triage system where callers are urged to phone an 800 number prior to heading to the ER. Once seen as inferior, telephone triage and advice is gaining more acceptance, especially among managed care organizations. Most phone lines are staffed by registered nurses who use a computerized algorithm to assess the patient's chief complaint (Pollard, 1992; Wilson et al., 1980). If the condition is nonurgent, the triage nurse then suggests alternatives to emergency treatment such as administering self-care or making an appointment to be seen in a more suitable setting like a primary or acute care clinic. Mindful of the potential for malpractice claims, the nurses are typically under strict orders not to give diagnoses or suggest specific treatments. Tennessee, which adopted a telephone triage and advice service when it

implemented TennCare, estimates that this saves $7.4 million annually. Oregon, another state to enroll its Medicaid population into MCOs, also uses this service and reports that it saved $184 per patient for its 14,000 Medicaid patients (Richards, 1995). These savings are realized as a result of diverting nonurgent patients from the ER to a host of less expensive alternatives. Some physicians, however, are troubled by the prospect of nurses guiding patients over the phone and do not embrace the notion. For now, however, the number of companies offering this service, and the number of beneficiaries enrolled to such services, are steadily increasing (Richards, 1995).

For those patients who make it to the ER and are identified as nonurgent, most health care organizations employ redirecting, or fast tracking (Kerr, 1989). This diverts less severely ill or injured patients from the ER to acute or minor care clinics ideally located adjacent to the ER or otherwise in close proximity. Hospitals that have implemented a fast track system report up to a 50 percent reduction in nonurgent use of the ER, waiting times reduced from hours to minutes, direct ER costs cut in half, and improvement in overall levels of patient satisfaction (Greene, 1992).

Similar to fast tracking, a study by the Health Care Advisory Board (HCAB) in 1993 recommends the use of primary care liaisons as a way to minimize the use of the ER for primary care. This entails placing a primary care liaison, usually a registered nurse, in the ER with two primary objectives. First, the liaison serves as the conduit between the nonurgent ER patient and the primary or acute care clinic (owned or contracted by the hospital). They typically have access to the clinics' scheduling templates and can schedule a nonurgent ER patient with a provider within a specified time. The liaison's

second purpose is to educate the nonurgent ER patient about the importance of using primary care and how to access such care. Most ER staffs lack the time and expertise to educate patients in this regard. Absent any patient education, most nonurgent ER users continue to use the ER for the same or related problems (HCAB, 1993). Thus, the use of a primary care liaison creates a win-win situation. The HCAB study reports that hospitals utilizing a primary care liaison achieve great success in steering patients to primary care providers, convincing over 90 percent of nonurgent patients to stop using the ER as the means of obtaining their health care.

Another means of obtaining access to primary care sometimes requires the health care organization to simply adjust the hours of their primary care operation to attract nonurgent users before they enter the ER. By offering more convenient hours to their patients, primary care and community care clinics substitute as the target of opportunity for nonurgent ER users. Most working adults and families like the convenience and accessibility extended-hours clinics offer (Hansagi, 1992). This outlook is the driving force behind the growing market of freestanding urgent care centers, or "doc-in-a-box" operations (Tanner, 1982). Parkland Memorial Hospital in Dallas, Texas recognized the need to provide extended hours in its seven-clinic network of community care clinics. The change in operating hours came as a result of patient feedback and resulted in staggering some of the clinics' opening times. This move extended the overall amount of available time for patient visits to well into the evening. The hospital reports a substantial reduction in nonurgent visits to its ER, resulting in a sizable cost saving achieved by providing $55 primary care visits rather than $125 ER visits (Greene, 1992).

A number of studies have examined the effectiveness of self-care interventions as a way to curtail nonurgent ER usage. In a study that explored the impact of self-care on ambulatory care usage, including the ER, Vickery et al. (1988) examined a Medicare population. The researchers report a 15 percent decrease in the total number of ambulatory care visits in the experimental group as compared to the control group. They conclude that a health education program on self-care and individual decision making can effectively reduce nonurgent utilization while demonstrating no negative impact on the quality of health. More recently, an unpublished study by the U.S. Air Force (1993) investigated the effect that providing beneficiaries with a medical self-care handbook has on reducing unnecessary and nonurgent outpatient visits. This study involved a pilot program conducted at three Air Force bases, where beneficiaries were provided with a copy of the "Take Care of Yourself" self-care manual along with a 20-minute orientation on how to use the book. The results revealed that just six months after distributing the handbook, the percentage of nonurgent ER visits dropped by 28 percent. The results of the demonstration project are encouraging and Foundation Health Federal Services (FHFS), the managed care support contractor in Region VI (which includes Reynolds), in fact distributed this self-care manual to all Reynolds' TRICARE Prime enrollees (FHFS Briefing, 1995). Regrettably, no instructions were provided to the users of the manual which may degrade the achievable effectiveness.

Health care economists often argue that if people have to pay for something, they will use less of it (Lohr et al., 1986; Rice and Thorpe, 1993; Rice, 1994). When consumers bear some or all of the financial burden associated with receiving health care,

this affects their health care seeking behavior to include use of emergency services (O'Grady et al., 1985). The introduction of a even a small co-payment for each ER visit can have an immediate effect on ER utilization. In a recent study, Selby et. al. (1996) examined the effect of a small copayment ($25 to $35) on ER use in a group-model HMO in northern California. After adjusting for age, sex, and socioeconomic status, they found a decline of 14.6 percent in ER use among enrolled members. Perhaps most telling in this study was the fact this decrease was associated with mostly those patients with conditions considered nonurgent. Notable also was the finding that the study found no adverse effects, as measured by mortality and number of potentially avoidable hospitalizations, among the copayment group as a result of their decreased ER use.

In reducing the percentage of nonurgent use of the ER and diverting patients to alternative sources of care, health care organizations grapple with the perception of an ethical dilemma: refusing or withholding medical care. While many studies convincingly demonstrate that selective triage can be safely used to refuse ER care to nonurgent patients and direct them to other settings (Derlet et al. 1990; Derlet et al., 1992: Derlet et al., 1995; Lowe et al., 1994), the prospect is disturbing and troublesome for many in the medical community. The argument within this issue runs the complete spectrum, from defining what a true emergency really is, to skirting COBRA laws, to the paternalism reflected in the white-coated authority sending patients away (Rothstein, 1990). Triage means sorting out, not eliminating or discarding. Efforts designed to reduce ER utilization must keep the legal, moral, and ethical issues in mind while

striking a resource-constrained balance of providing care to patients with true emergencies while not penalizing those with nonurgent conditions.

Purpose

The purpose of this study is to determine if changes in use of the ER occur as a result of delivering health care services in a TRICARE environment, and if they do, to determine the magnitude and direction of any changes. Concurrently, measuring nonurgent use before and after implementing TRICARE can serve as an effective estimate of how well the organization is conducting prevention and wellness, patient education, and providing access to primary care for TRICARE Prime enrollees. To this end, the study aims to examine nonurgent use, the dependent variable, as a function of twelve independent variables: patient age, gender, beneficiary status, grade/sponsor grade, patient's zip code, time of arrival, length of time to be seen by provider, total time of ER visit, day of the week, chief complaint, disposition, and mode of arrival. This too will support the primary objective to judge and evaluate any differences in utilization of the ER pre- and post-TRICARE implementation.

The first alternate hypothesis (H_a) is: utilization of the ER varies as a function of TRICARE. The first null hypothesis (H_o) is: utilization of the ER is not influenced by TRICARE. In determining if nonurgent ER utilization can be predicted, the second alternate hypothesis (H_a) is: nonurgent use of the ER varies as a function of age, gender, grade, patient zip code, beneficiary status, arrival time, time seen by provider, total time of ER visit, day of the week, chief complaint, disposition, and arrival mode. The second

null hypothesis (H_o) is: nonurgent use of the ER does not vary as a function of the twelve independent study variables.

METHODS AND PROCEDURES

Study Sample

The sample of this study consisted of two groups. The first group was a convenience sample of those patients who presented to the ER during nine days in 1995; three days each, randomly selected, in January, February, and March. This group is the pre-TRICARE group and in effect serves as the control group (n = 518). The second group consists of a convenience sample of patients who presented to the ER during nine days in 1996; again, three days each from the January through March period. This group is the post-TRICARE group and serves as the study group (n = 410). The study period of January through March (for both groups) was selected based on Reynolds implementing TRICARE on 1 November 1995. The months of November and December 1995 were considered implementing months not suitable for data collection. It was believed that data collection could begin in January 1996, well after TRICARE implementation, and had to end in March to allow for sufficient time to analyze, interpret, and explain the data gathered, while still meeting the research submission deadline.

The main data source for this study is the automated Standard Form 558 (SF558), titled "Emergency Care and Treatment Record", which is the document used in the ER to record patient care provided during the course of a visit. Attached to this form is the automated triage form. This form has no numeric designation and is titled "Triage Record." The compilation of the SF558s and automated triage forms constitutes the

daily "ER log" and is hereinafter referred to as such. The ER log reflects, among other things, the resulting triage category of 1, 2, or 3. This triage system is designed to ensure the most seriously ill or injured patients receive care first. A patient triaged as category 1 (emergent) is considered a medical crisis who requires immediate medical attention. A category 2 patient (urgent) is deemed a medical emergency with a time-sensitive injury or illness. Those patients in category 3 are considered to require nonurgent care. For this study, triage category is a useful proxy for acuity level and allows for measuring nonurgent use of the ER. The ER at Reynolds is designed and staffed to treat the true medical crises and emergencies, category 1 and 2 patients, rather than nonurgent category 3 patients.

A total of 13 study variables were gleaned from the ER log. These 13 variables were subdivided to further stratify the sample, yielding a total of 59 variables. The dependent variable is triage category. This is a nominal variable recorded as the patient's triage category and serves as a means of tabulating the amount of emergent, urgent, and nonurgent use of the ER. The triage category variable was further stratified into a mutually exclusive, categorically exhaustive variable, coded 1 if in a particular triage category, 0 otherwise. This type of data coding is sometimes referred to as "dummy coding" (Munro and Page, 1993). The independent variables are a combination of binary variables and mutually exclusive, categorically exhaustive variables.

The study has three binary variables: Gender, which is coded 1 if male, 0 otherwise; arrival mode, which is coded 1 if by ambulance, 0 otherwise; and day of the week which is coded 1 if weekday, 0 otherwise. There are a total of ten mutually exclusive,

categorically exhaustive variables which are sub-groupings within the variable, coded 1 if in the particular group, 0 otherwise. These variables include: age, beneficiary status, grade/sponsor grade, arrival time, time seen by provider, total time spent per ER visit, patient zip code, chief complaint, and disposition. For example, the variable of beneficiary status is stratified into six distinct groupings, coded 1 if in a particular group and 0 otherwise.

The ER log for patients who presented on each day sampled were collected and individual documents were counted. This figure was then cross-checked with the corresponding Daily Commander's Report on file in the Department of Nursing. The raw number of ER visits for the day is a relevant item of interest on the report. For those days where the number of SF558s/triage sheets were less than that reported on the Report, a thorough check of the ER records turned up most of the missing documents. Overall, the study achieved a 99.1 percent accuracy rate with respect to documentation on hand, with only eight missing records out of 936 total reported visits.

The triage algorithm used for the two groups differed considerably. The pre-TRICARE group used a triage rating of 1 through 4, with category 1 being a medical emergency and category 4 being routine care. In early November 1995, the ER staff reviewed the algorithm and aligned it with more clinically sensitive triage standards (Schossler, 1996). This resulted in dropping category 4 and using just three categories as previously detailed. The pre-TRICARE sample was "normed" as much as possible, including changing a total of 78 category 4 patients to category 3 status. Other changes in the algorithm, however, now result in some pre-TRICARE category 3 illnesses and

injuries being coded as category 2, and some pre-TRICARE category 2 patients now result in classifying as category 1. This change in the triage algorithm must be considered when reviewing the results of this study.

In construction of the data set, Microsoft Excel® version 5.0 was used. No identifying features about patients were used during the course of the study. Names, addresses, social security numbers and other potentially identifying patient characteristics were not incorporated into to the data set. Also, by using retrospective data collection no direct contact was necessary between the researcher and ER patients, thus ensuring patient anonymity. Collectively, these steps eliminated any potential ethical dilemmas associated with this research involving patient records.

The concerns of validity, reliability, and practicality are concerns this study considered in the construction and interpretation of the data set. By abstracting data that was already recorded, the content validity of the ER log was adopted as an accepted instrument. By serving as the sole researcher and using a strict, consistent abstracting process, intra-rater reliability was ensured. The last measurement of consideration is practicality. Kerlinger (1986) notes that a tool should be evaluated in practical terms of convenience, economy, and interpretability. The ER log is readily available, free, and very understandable.

Study Design

This study employed a non-experimental research design using pre-recorded data to investigate relationships between the study variables. Soeken (1985) recommends non-experimental designs when studying systematic relationships between variables without

requiring the active control of those variables. The non-experimental design in this study is the general linear model (GLM). This model is appropriate for studies that seek to analyze several different study variables thought to influence a particular phenomenon. The GLM will be used in this research in two ways. First, in compiling the study variables, a comparative analysis of the pre- and post-TRICARE groups will be conducted to determine the effect TRICARE may have on ER utilization. Second, using the GLM and multiple regression analysis, predictive factors that contribute to nonurgent ER utilization will be explored.

After entering the raw data into the Excel spreadsheet, each variable was then coded accordingly, binary or mutually exclusive, categorically exhaustive. The descriptive statistics were then calculated for each group. In comparing the two groups, a student's t-test was the statistical measure employed to determine the magnitude and direction of any differences in the group means. This was accomplished using the data analysis package contained in the Excel software, specifically, the "T-Test: Two-Sample Assuming Unequal Variance" available from the pull-down menu. After testing the mean of each group, the inferential statistics were compiled. Next, a zero-order correlation matrix was computed, again by using the software's data analysis package, and the resulting correlation coefficients were reviewed to determine those meeting or exceeding the critical value. The zero-order correlation matrix regressed the dependent variable, triage category 3 (nonurgent use), upon each of the predictor variables.

The subsequent step involved multiple regression analysis using stepwise regression. The variables meeting or exceeding the critical value for significant (positive and

negative) correlations were added to the regression model. At each step of the regression procedure, a partial F test was conducted for each variable currently in the model, treating the variable as if it were the most recent one entered, regardless of when it was actually entered. The variable with the smallest non-significant partial F statistic was removed from the model and the model was then reworked with the remaining variables. This process was repeated at each step on the basis of each variable's ability to improve the predictive efficiency of the dependent variable. Variables incorporated at an earlier step in some cases became needless because of their relationship with other variables in the model. This process continued until no more variables could be entered or removed and the variables remaining in the model provided the best prediction of the dependent variable (Munro and Page, 1993). A regression model for each group was developed using this method.

THE RESULTS

In comparing the two data sets, the first obvious difference is the volume of patients visiting the ER. Each sample represents nine total days of ER use. The pre-TRICARE group has an $n = 518$ while the post-TRICARE group has an $n = 410$. As can be seen in Table 1, the daily mean between the two groups, 57. 6 and 45.6, decreased by an average of 12 patients per day, or -20.8 percent. Analysis using a student's t-test reveals that this difference is statistically significant, with $t(16) = 4.29$, $p < .00$.

A comparison of each group by variable is depicted in Table 2. Presented in this manner, it allows for easy contrast of the two groups. Differences in each variable reveal much about ER use in a managed care environment like TRICARE. Table 3 provides the

TABLE 1. AVERAGE DAILY VOLUME OF PATIENTS SEEN IN ER

Pre-TRICARE Sample Day Sampled	# Patients Seen	Post-TRICARE Sample Day Sampled	# Patients Seen	Difference	% Difference	df	t	p
18-Jan-95	67	19-Jan-96	33					
22-Jan-95	61	23-Jan-96	42					
29-Jan-95	51	27-Jan-96	42					
3-Feb-95	59	8-Feb-96	47					
7-Feb-95	58	11-Feb-96	43					
13-Feb-95	62	20-Feb-96	52					
16-Mar-95	50	12-Mar-96	51					
19-Mar-95	52	16-Mar-96	52					
25-Mar-95	58	21-Mar-96	48					
Total	518	Total	410					
Daily Mean	57.56	Daily Mean	45.56	-12.00	-20.8%	16	4.29	.00
Std Dev	5.64	Std Dev	6.23					

Source: ER Log (SF 588s & Triage Sheets) examined during study

results of the inferential statistics for those variables found to be statistically significant ($p < .05$) after all were tested using the student's t-test measure. Variables not listed in Table 3 are not statistically significant.

The mean age for the pre-TRICARE and post-TRICARE samples was 25.1 and 26.1 years, respectively. The mean difference of one year was not statistically significant. While there were some fluctuations among percentages of each age grouping, none of these differences were statistically significant. The effects of the change in the triage algorithm are clearly evident when comparing mean triage categories. The one constant finding is that patients in the oldest age group, 56 years and older, use the ER least proportionately but, as evidenced by their low mean triage category, are the most acutely ill or injured when they do present.

Males continue to use the ER more than females. Males comprised 52.5 percent and 52.7 percent for the pre- and post-TRICARE groups, respectively. There are no statistically significant differences between male and female utilization of the ER. The proportions of each gender remain almost constant pre- and post-TRICARE. A notable difference exists in mean triage category. Females had a higher mean triage category in the pre-TRICARE group, indicating more nonurgent use by this gender. In the post-TRICARE groups, this phenomenon is reversed with males having a slightly higher mean triage category than females.

When stratified by beneficiary status, ER use among the six groupings varied slightly between the two groups. Active duty members and retirees and their family members used the ER at higher rates in the post-TRICARE group; however, none of these increases were statistically significant. Likewise, the decrease in use among active duty dependents was not statistically significant. Active duty dependents demonstrated the most nonurgent use (mean triage category = 2.72) in the pre-TRICARE group while active duty members proved to have the most nonurgent use in the post-TRICARE group (mean triage category = 2.32). The very low mean triage category of 1.75 associated with the post-TRICARE civilian/other grouping is indicative of the non-military medical emergencies that are frequently diverted to Reynolds' ER as one of the nearest medical treatment facilities in the area.

The grade, or retired grade, of the member or sponsor reveals some variation among the groupings but none are statistically significant. The largest increase in ER use, 2.9 percent, was among officers (active and retired) and their family members, comprising

TABLE 2. DESCRIPTIVE STATISTICS FOR DEPENDENT AND INDEPENDENT VARIABLES

	Pre-TRICARE Sample (n = 518)				Post-TRICARE Sample (n = 410)			
Variable	n	% of Sample	Mean Triage Category	Std Dev	n	% of Sample	Mean Triage Category	Std Dev
AGE								
0-17	171	33.0%	2.78	0.48	137	33.4%	2.20	0.71
18-35	223	43.1%	2.61	0.57	162	39.5%	2.23	0.75
36-55	72	13.9%	2.39	0.68	60	14.6%	2.28	0.72
56 <	52	10.0%	2.17	0.76	51	12.4%	1.96	0.75
GENDER								
Female	246	47.5%	2.62	0.59	194	47.3%	2.18	0.76
Male	272	52.5%	2.57	0.63	216	52.7%	2.21	0.71
BENEFICIARY STATUS								
Active Duty	138	26.6%	2.59	0.60	112	27.3%	2.32	0.69
AD Dependent	259	50.0%	2.72	0.51	198	48.3%	2.16	0.75
Retiree	46	8.9%	2.22	0.73	41	10.0%	2.15	0.69
Retiree Dependent	52	10.0%	2.42	0.75	43	10.5%	2.21	0.80
Survivor Ret/AD	7	1.4%	2.57	0.53	4	0.1%	2.00	0.69
Civilian/Other	16	3.1%	2.38	0.72	12	2.9%	1.75	0.62
GRADE/SPONSOR GRADE								
E1-E4	190	36.7%	2.67	0.54	150	36.6%	2.21	0.74
E5-E9	267	51.5%	2.53	0.64	200	48.8%	2.25	0.74
W1-W4	7	1.4%	2.85	0.37	6	1.5%	1.67	0.52
O1-O7	38	7.3%	2.71	0.61	42	10.2%	2.10	0.69
Civilian/Other	16	3.1%	2.38	0.72	12	2.9%	1.75	0.62
PT ZIP CODE								
73501	65	12.5%	2.60	0.61	45	11.0%	2.11	0.78
73503	142	27.4%	2.58	0.61	110	26.8%	2.29	0.73
73505	210	40.5%	2.57	0.62	175	42.7%	2.20	0.72
73507	60	11.6%	2.78	0.45	48	11.7%	2.17	0.75
All Others	41	7.9%	2.49	0.71	32	7.8%	2.00	0.72
ARRIVAL MODE								
Ambulance	36	6.9%	2.50	0.70	15	3.7%	1.53	0.52
POV	482	93.1%	2.60	0.60	395	96.3%	2.20	0.73
ARRIVAL TIME								
07:01 - 15:00	167	32.2%	2.49	0.66	139	33.9%	2.09	0.73
15:01 - 23:00	233	45.0%	2.59	0.66	165	40.2%	2.09	0.71
23:01 - 07:00	118	22.8%	2.75	0.54	106	25.9%	2.50	0.69
DAY OF WEEK								
Weekend	175	33.8%	2.65	0.56	153	37.3%	2.24	0.69
Weekday	343	66.2%	2.57	0.64	257	62.7%	2.17	0.76

TABLE 2 (CONTINUED). DESCRIPTIVE STATISTICS FOR DEPENDENT AND INDEPENDENT VARIABLES

	Pre-TRICARE Sample (n = 518)				Post-TRICARE Sample (n = 410)			
Variable	n	% of Sample	Mean Triage Category	Std Dev	n	% of Sample	Mean Triage Category	Std Dev
CHIEF COMPLAINT								
Abdominal pain	34	6.6%	2.88	0.33	29	7.1%	2.31	0.80
Difficulty breathing	44	8.5%	2.36	0.72	43	10.5%	1.79	0.71
Chest pain	33	6.4%	1.82	0.68	31	7.6%	1.58	0.62
Cold/Flu symptoms	62	12.0%	2.87	0.38	63	15.4%	2.25	0.67
Head pain/injury	43	8.3%	2.47	0.55	38	9.3%	1.87	0.66
Vaginal bleeding	20	3.9%	2.55	0.60	10	2.4%	2.20	0.63
Upper extrem. injury	41	7.9%	2.80	0.40	38	9.3%	2.24	0.63
Lower extrem. injury	30	5.8%	2.87	0.35	16	3.9%	2.56	0.63
EEN pain/injury	31	6.0%	2.61	0.67	30	7.3%	2.30	0.65
Nausea, vomitting	41	7.9%	2.73	0.50	29	7.1%	2.66	0.55
Other	139	26.8%	2.55	0.63	83	20.2%	2.41	0.73
SEEN BY PROVIDER								
0 - 1 hr.	317	61.2%	2.46	0.67	328	80.0%	2.14	0.73
1:01 - 2 hrs.	116	22.4%	2.75	0.47	66	16.1%	2.42	0.70
2:01 - 3 hrs.	57	11.0%	2.89	0.31	14	3.4%	2.36	0.84
3:01 <	28	5.4%	2.81	0.40	2	0.5%	2.50	0.71
TOTAL TIME IN ER								
0 - 1 hr.	74	14.3%	2.74	0.50	82	20.0%	2.34	0.62
1:01 - 2 hrs.	168	32.4%	2.59	0.59	149	36.3%	2.20	0.73
2:01 - 3 hrs.	126	24.3%	2.56	0.66	79	19.3%	2.03	0.78
3:01 - 4 hrs.	86	16.6%	2.62	0.64	47	11.5%	2.04	0.70
4:01 <	64	12.4%	2.49	0.62	53	12.9%	2.25	0.81
DISPOSITION								
Admission to hosp	49	9.5%	2.67	0.59	45	11.0%	2.00	0.80
F/U with FPC	273	52.7%	2.62	0.61	217	52.9%	2.19	0.72
F/U with TMC	65	12.5%	2.51	0.59	70	17.1%	2.31	0.71
F/U with Spec Svc	85	16.4%	2.61	0.58	59	14.4%	2.25	0.73
F/U with Peds	17	3.3%	2.53	0.72	4	1.0%	2.25	0.50
LWBS/AMA	14	2.7%	2.57	0.51	5	1.2%	1.60	0.89
Other	15	2.9%	2.40	0.83	10	2.4%	2.20	0.79
TRIAGE CATEGORY								
Category 1	34	6.6%	-	-	78	19.0%	-	-
Category 2	141	27.2%	-	-	174	42.4%	-	-
Category 3	343	66.2%	-	-	158	38.5%	-	-
All Categories			2.60	0.61			2.20	0.73

Sample taken from nine days (3 days from Jan, Feb, Mar) of ER records, 1995 (pre-TRICARE) and 1996 (post-TRICARE)

7.3 percent of the pre-TRICARE group and 10.2 percent of the post-TRICARE group. This increased proportion, however, appears to be legitimate utilization of ER resources as the post-TRICARE officer grouping has a low mean triage category of 2.10.

Patients residing in zip code area 73505 comprised the largest group of ER users for both the pre- and post-TRICARE groups. None of the minor variations between the rates of the two groups' zip code categories are statistically significant. Those ER patients who live on Fort Sill, in zip code area 73503, have the highest mean triage category (2.29) in the post-TRICARE group. This group of ER users lives closest to the hospital demonstrating that proximity may indeed influence ER utilization.

The rate of patients arriving by ambulance dropped markedly in the post-TRICARE group while their acuity level increased. In the pre-TRICARE group, 6.9 percent of patients arrived by ambulance while the post-TRICARE group showed just a 3.7 percent ambulance arrival rate. This 3.2 percent decrease in patients arriving via ambulance is statistically significant, with $\underline{t}\,(922) = 2.26$, $p < .02$.

The mean time of day that patients in the pre-TRICARE group arrived was 15:14 hours while the mean for the post-TRICARE group was 14:20 hours. The mean difference of 1:06 was statistically significant, with $\underline{t}\,(874) = 2.11$, $p < .04$. Examination of the three arrival time sub-categories revealed no statistically significant differences. Noteworthy, however, is the change in acuity level as measured by mean triage category. The pre-TRICARE group demonstrated incremental decreases in acuity level from one time period to another, culminating in the last shift, 23:01 to 07:00, seeing mostly nonurgent patients (2.75 mean triage category). In contrast, the post-TRICARE group

TABLE 3. INFERENTIAL STATISTICS FOR ALL SIGNIFICANT* FINDINGS

Variable	Pre-TRICARE Mean	Post-TRICARE Mean	Difference	df	t	p
Arrival time	15:14 hrs.	14:20 hrs.	-1:06	874	2.11	.04
Arrival by ambulance	0.069	0.037	-0.03	922	2.26	.02
Complaint 'other'	0.268	0.202	-0.07	909	2.37	.02
Seen w/i 1 hr.	0.612	0.800	0.19	925	-6.45	.00
Seen w/i 3:01 <	0.054	0.005	-0.05	637	4.67	.00
Tot ER time 1 hr. >	0.143	0.200	0.06	817	-2.28	.02
F/U with Peds	0.033	0.010	-0.02	835	2.50	.01
Category 1	0.066	0.190	0.12	656	-5.60	.00
Category 2	0.272	0.424	0.15	831	-4.86	.00
Category 3	0.662	0.385	-0.28	866	8.70	.00
All Triage Categories	2.60	2.20	-0.40	792	8.90	.00

* Significant at the $p < .05$ level (two-tail)

acuity level did not incrementally increase but maintained very consistent, high acuity levels (2.09 mean triage category) throughout the first two shifts. The last shift of the post-TRICARE group posted a lower acuity level (2.50 mean triage category) for patients arriving during this time period compared to the pre-TRICARE group. This increase in mean triage category reflects a decrease in acuity level and indicates more nonurgent use during this time period than other periods. This reflects the fact that the Minor Care Clinic is closed from midnight to 0800 hours which forces the ER to treat all patients including the category 3 patients who would otherwise be sent to the Minor Care Clinic.

Weekend use of the ER rose from 33.8 percent in the pre-TRICARE group to 37.3 percent in the post-TRICARE group. This 3.5 percent increase is not statistically significant. The fact that about one-third of all days sampled were a weekend day (Saturday or Sunday) is reflected in each of the groups' composition where about one-

third of patients were weekend users of the ER. The one consistency between the two groups is the fact that those patients who use the ER during the weekend are less severely ill or injured than weekday users of the ER.

The eleven sub-categories of the variable 'chief complaint' have remarkably consistent rates from group to group. Although there are some small variations between the two groups, only one sub-category, the group of 'other', is statistically significant. The eleven sub-category variables is where the change in the triage algorithm can best be observed. The algorithm was specifically re-worked to be more sensitive to elevated temperatures, particularly in pediatric patients, as well as those patients experiencing respiratory distress and head pain or injury (Schossler, 1996). Consequently, some pre-TRICARE category 3 patients would be categorized as 1 or 2 using the post-TRICARE algorithm. For this reason, any comparison in mean triage category must be considered in this context. While there were some fluctuations in sub-category rates between the two groups, only the sub-category 'other' is statistically significant. The pre-TRICARE group had 26.8 percent of patients classified in this sub-category while the post-TRICARE group had 20.2 percent. This 6.6 percent difference is statistically significant, with $\underline{t}\ (909) = 2.37$, $p < .02$.

The length of time patients wait to see a health care provider decreased dramatically. In the pre-TRICARE group, 61.2 percent of patients were seen by a provider within one hour of arriving at the ER. This increased to 80.0 percent in the post-TRICARE group. This 18.8 percent increase in being seen within one hour is statistically significant, with $\underline{t}\ (925) = -6.45$, $p < .00$. Additionally, those patients who wait 3:01 and longer decreased

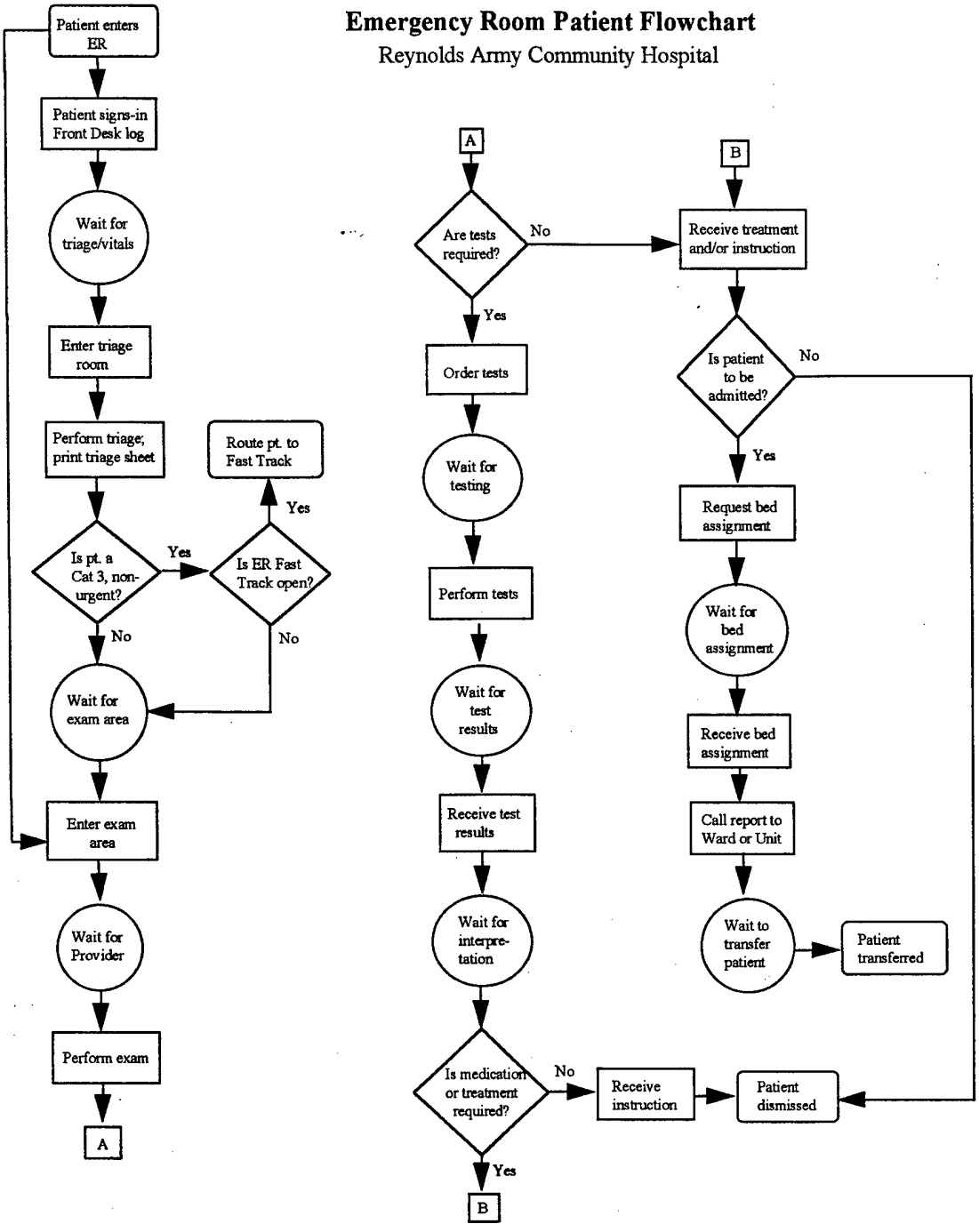

Fig. 1 Patient flow through Reynolds' ER

from 5.4 percent in the pre-TRICARE group to just 0.5 percent in the post-TRICARE group. This 4.9 percent decrease is also statistically significant, with $\underline{t}$ (637) = 4.67, $p < .00$. The improvement in service times at both ends of the waiting spectrum bodes well for bettering the ER's customer service and general patient satisfaction.

The total length of time patients spend in the ER is improving as well. This improvement is best appreciated when viewing how patients flow through the ER as depicted in Figure 1. The most significant gain is in the sub-category of patients who spend one hour or less in the ER. The pre-TRICARE group had 14.3 percent of patients in this sub-category while the post-TRICARE group had 20.0 percent. This 5.7 percent increase is statistically significant, with $\underline{t}$ (817) = -2.28, $p < .02$. Very little changed, however, among those patients who spend the longest period, 4:01 or longer in the ER, with 12.4 percent of patients in the pre-TRICARE group and 12.9 percent in the post-TRICARE group placed in this sub-category.

The variable of disposition of ER patients has seven sub-categories. The sub-category of 'follow-up with pediatrics' is the only statistically significant variable in comparing the two groups. The pre-TRICARE group experienced a 3.3 percent rate for this sub-category compared to a 1.0 percent rate for the post-TRICARE group. The difference of 2.3 percent is statistically significant, with $\underline{t}$ (835) = 2.50, $p < .01$. Another notable, yet not statistically significant finding, is an increase in the hospital admission rate from 9.5 percent to 11.0 percent, with a corresponding increase in the acuity level (mean triage category of 2.00 for the post-TRICARE group). The LWBS/AMA rate also improved, from 2.7 percent in the pre-TRICARE group to 1.2 percent in the post-

TABLE 4. RESULTS OF STEPWISE MULTIPLE REGRESSION

Dependent Variable is Nonurgent ER Use (Category 3)

Model	Source	Sum of Squares	df	Mean Square	F	p
	Regression	27.02	13	2.08	11.79	0.00
Pre-TRICARE	Residual	88.86	504	0.18		
Model	Total	115.88	517			

Variable	Regression Coefficient	R Square
Intercept	0.57	0.233
Age 0-17	0.13	
Age 56 <	-0.11	
AD Dependent	0.04	
Retiree	-0.07	
Arrival 23:01-07:00	0.16	
Tot ER time 2:01-3 hrs	0.17	
Abdominal pain	0.24	
Difficulty breathing	-0.21	
Chest pain	-0.41	
Cold/Flu symptoms	0.09	
Head pain/injury	-0.19	
EEN pain/injury	0.23	
Zip Code 73507	0.09	

	Regression	22.38	13	1.6	8.45	0.00
Post-TRICARE	Residual	74.74	396	0.19		
Model	Total	97.12	409			

Variable	Regression Coefficient	R Square
Intercept	-0.05	0.231
Age 56 <	-0.04	
Civilian/Other	-0.14	
Grade W1-W4	-0.16	
Arrival 23:01 - 07:00	0.25	
Seen w/i 1:01-2 hrs.	0.11	
Difficulty breathing	-0.17	
Chest pain	-0.23	
Head pain/injury	-0.21	
Lower extrem. injury	0.20	
Nausea/vomitting	0.24	
Other complaints	0.20	
Zip Code 73503	0.06	
Arrival by POV	0.35	

Summary of output from Excel spreasheet data analysis (multiple regression analysis)

TRICARE group. While not statistically significant, this decrease in the LWBS/AMA rate is encouraging and compares favorably with the national average of between one and three percent (Wiesberg, 1986). Of concern, however, is that these patients are among the most acutely ill or injured of all ER patients (mean triage category of 1.60). Also of interest is the decrease in the rate of the variable 'follow-up with specialty service.' There is a 2.0 percent decrease, from 16.4 to 14.4 percent, from the pre- to the post-TRICARE group. This may be a simple reflection of managed care which places more emphasis on prevention and primary care and scrutinizes closely the referral of patients to specialty services. Supporting this position is the large numbers of ER patients who are advised to see their primary care manager (PCM) and thus are categorized in the 'follow-up with family practice clinic' sub-category. In both of the sampled groups, more than 52 percent of all ER patients depart the facility with instructions to continue their care with their assigned PCM.

As previously noted, the change in the triage algorithm has some obvious effect on the pre- and post-TRICARE groups, although the exact effect is undetermined. Nonetheless, the differences among all category rates are statistically significant. The mean of 2.60 for the pre-TRICARE group and 2.20 for the post-TRICARE group is highly statistically significant, with $\underline{t}\,(792) = 8.90$, $p < .00$. More important, perhaps, is the fact that nonurgent use of the ER decreased 27.7 percent, such that the post-TRICARE group results in just 38.5 percent of patients being triaged as category 3. This is a complete reversal from the pre-TRICARE group where 66.2 percent of patients were

considered nonurgent patients. The 27.7 percent drop in nonurgent use is extremely statistically significant, with $\underline{t}$ (866) = 8.70, $p < .00$.

Table 4 depicts the results of the stepwise multiple regression procedure for each group, as previously detailed. Each regression model accounts for just over 23 percent of the variance associated with nonurgent use of the ER but they incorporate different variables in the construction of their respective models. The pre-TRICARE model results in slightly more efficient predictive capacity with an $\underline{R}^2 = .233$ and is more statistically significant with an $\underline{F} = 11.79$. In contrast, the post-TRICARE model yields an $\underline{R}^2 = .231$ and an $\underline{F} = 8.45$. Both models have a p value < .00. Each model is therefore modest in its predictive efficiency yet each is very statistically significant.

A prudent determination of the two alternate hypotheses developed at the start of this study can now be made. The first alternate hypothesis stated that utilization of the ER varies as a function of TRICARE. The statistically significant decreases in both the volume of ER patients and the amount of nonurgent use, and the differences in eleven statistically significant individual sub-category variables allow acceptance of this alternate hypothesis: ER utilization does in fact vary as a function of TRICARE. The first null hypothesis is therefore rejected.

The second alternate hypothesis was: nonurgent use of the ER varies as a function of age, gender, grade, patient zip code, beneficiary status, arrival time, time seen by a provider, total time of ER visit, day of the week, chief complaint, disposition, and arrival mode. The regression model constructed for each study group was statistically significant demonstrating that nonurgent use of the ER did vary as a function of the study

variables. Thus the second alternate hypothesis is also accepted and the second null hypothesis rejected.

DISCUSSION

There are many interesting results from this study worthy of in-depth elaboration. Among the more compelling findings are the decrease in ER volume, the decrease in nonurgent use, the improvement in service times, and the differences in certain characteristics of ER use. The results of the regression models also deserve comment and discussion. Lastly, the limitations of the study cannot be overlooked and concludes the discussion portion of this study.

The 20.8 percent decrease in ER utilization is not completely unexpected. Madigan Army Medical Center (MAMC) implemented TRICARE eight months before RACH, in March 1995, and as can be seen in Table 5, experienced a 20.2 percent drop in monthly ER patient volume which was extremely statistically significant, with $\underline{t}\,(12) = 14.25$, $p < .00$ (Clark, 1996; MAMC MEPRS, 1996). The consistent 20+ percent drop in ER volume experienced by MAMC and RACH suggests that other facilities implementing TRICARE may expect the same phenomenon. The mirror-like results between these two MTFs is remarkable considering the contrasts between the facilities. Reynolds is a small medical department activity (MEDDAC) located in rural southwest Oklahoma. Madigan is a large medical center, with a teaching mission, found in the Pacific northwest. A difference noted between the two MTFs experience is that of the acuity level of ER patients. The data from this study indicates that acuity increased between the pre- and post-TRICARE groups (the change in triage algorithm notwithstanding), suggesting more

TABLE 5. MADIGAN ARMY MEDICAL CENTER ER EXPERIENCE PRE- & POST-TRICARE

Nine Months Before TRICARE		Nine Months After TRICARE						
Month	No. Visits	Month	No. Visits	Difference	% Difference	df	t	p
Jun-94	5852	Apr-95	4312					
Jul-94	5965	May-95	4608					
Aug-94	5802	Jun-95	4565					
Sep-94	5554	Jul-95	4664					
Oct-94	5636	Aug-95	4591					
Nov-94	5515	Sep-95	4498					
Dec-94	5355	Oct-95	4551					
Jan-95	5979	Nov-95	4577					
Feb-95	5796	Dec-95	4717					
Total	51454	Total	41083					
Mean	5717.1	Mean	4564.8	-1152.3	-20.2%	12	14.24	0.00
Std Dev	214.1	Std Dev	114.2					

Source: MAMC MEPRS, Med 302 Report, Dated 10 Jan 96

sensible use of facility. Madigan reported no decrease in acuity, which hovered near nonurgent levels, and that many Prime enrollees continued to seek nonurgent care in the ER because of the convenience it affords (Clark, 1996).

The exact reason for the decrease in ER volume is not explained by this study. At best, a comparison of the health care endeavors that existed at the time both groups were sampled may provide some insight as to *possible* reasons for this finding. The researcher observed first-hand a variety of initiatives, policies, and undertakings that were in place at the time the post-TRICARE group was sampled. Most of these efforts were aimed at meeting the access to care standards.

An important feature of the TRICARE Prime benefit is the requirement for the MTF to meet specific access to care standards. Patients requiring urgent care must be seen within 24 hours, routine care appointments are required to be made within seven days, and specialty care, via a consult, must be provided within thirty days. The link between

access to primary care and ER use is well documented (Schesser et al., 1991; Padgett and Brodsky, 1992; Baker et al., 1994; GAO, 1993) although it was not an aim of this study to determine such a correlation at Reynolds. Many of the efforts affecting the post-TRICARE group are designed, among other things, to specifically ensure that the TRICARE Prime access standards are met for all enrollees. Anecdotal and empirical data from a number of surveys conducted by the RACH staff support the contention that access to primary care for those enrolled in Prime has increased (RACH Survey Results, 1996). This increase in access to primary care no doubt contributes to the corresponding decrease in ER volume, yet the exact effect is not measured by this study.

The significant decline in nonurgent ER use by the post-TRICARE group is best explained as being a function of several factors. Re-engineering of the automated triage algorithm, as previously detailed, obviously contributes to the decline in nonurgent use, but the precise magnitude is not known. It seems logical that if patients are categorized differently from the start of the ER visit, the cumulative effect will manifest itself in the proportions of emergent, urgent, and nonurgent patients. Still, other factors reasonably contribute to the decline in overall nonurgent ER use. Some of these factors are thought to include the Nurse CARE Center, the Health Care Information Line (HCIL), and a policy change in the ER regarding treatment of nonurgent non-Prime enrollees.

The Nurse CARE (Center for Access and Resource Enhancement) Center is an innovative telephone advice and triage system for those RACH Prime enrollees seeking a same-day (urgent) appointment in their assigned family practice clinic. The Center, staffed by a mix of nurse practitioners and experienced medical-surgical nurses, makes

urgent appointments for patients who actually *need* one as opposed to those who *want* one. This entails the Center staff using a triage algorithm and speaking with the patient (or parent, for pediatric patients) to determine the best course of treatment. Some patients can be effectively treated using self-treatment protocols described in the "Take Care of Yourself" and "Take Care of Your Child" manuals distributed to each Prime enrollee. In some instances, the Center is able to divert patients who might have sought treatment in the ER for nonurgent conditions to other settings such as self-care at home or appointing the patient to a routine primary care appointment. The data from the Nurse CARE Center shows that about 4.2 percent of callers can be steered toward settings other than the ER/Minor Care Clinic (Nurse CARE Center reports, 1996). This allows RACH to manage the available urgent appointments more effectively, ensuring that those patients who really need an urgent appointment receive one. Moreover, the Center is another resource for patients to utilize as an alternative to the ER or Minor Care Clinic, which adds to the decrease in ER volume and nonurgent use.

The HCIL is a 24-hour per day telephone advice line available to all TRICARE Prime enrollees. This service is delivered by a subcontractor of FHFS. Patients can phone in for advice, provided by a registered nurse using an automated algorithm, regarding their health concern. Feedback from this service indicates that during the months of January and February 1996, the HCIL nurses were able to dissuade 130 of 153 Fort Sill area callers (85.0 percent) from making a visit to the ER because the condition did not warrant such a visit (FHFS HCIL Reports, 1996). The HCIL nurses were able to

divert these callers to other settings for receiving care. Again, some of this may have translated into the reduced nonurgent demand on Reynolds' ER.

A change in the policy of treating non-Prime patients seemingly had an affect on nonurgent ER use. The intent of the policy was to entice active duty family members who had not yet enrolled in Prime into doing so. An unintended effect may have been on nonurgent ER use. Early in January, the policy went into effect regarding the treatment of ER patients such that all Prime enrollees would be seen and treated before any non-Prime enrollee. This of course was dependent on triage category and did not affect the practice of treating a category 1 or 2 non-Prime enrollee before a category 3 Prime patient. This policy mostly affected category 3 patients, where Prime enrollees were treated before non-Prime patients, regardless of how long the non-Prime patient may have been waiting relative to the Prime patient. This policy reasonably affected nonurgent use of the ER, but to what extent remains unknown. Some non-Prime patients who experienced frustration with this policy conceivably stopped using the ER for nonurgent conditions.

The concern that the ER would be overrun with Medicare-eligible patients never materialized into a reality. While the oldest age group increased slightly in the post-TRICARE group, the increase was not statistically significant. This is perhaps a testament to the aggressive marketing and education efforts by the RACH staff aimed specifically at this segment of the population and the impact TRICARE would have on their ability to receive health care at Reynolds. For some patients, the slow build up of empanled Prime patients allowed for sufficient space-available appointments at RACH to

fill their needs. A large number of others presumably made other arrangements and began obtaining their health care from providers in the community. At the time of this publishing, Reynolds was offering a corollary to the TRICARE Prime benefit termed 'Silver Care.' This program is geared toward empaneling a relatively small number of Medicare eligible beneficiaries into Reynolds and providing them health care through the remainder of FY 96. This product line is only temporary in nature and it is hoped that a Medicare HMO demonstration project involving the county hospital and a civilian managed care organization will become a viable option for this population during the summer of 1996. In the interim, Reynolds will continue to provide as much health care to these citizens as is possible.

The average age of both groups, 25.1 for the pre- and 26.1 for the post-TRICARE, is generally younger than that reported in the general literature (Schesser et al., 1991; Anson et al., 1991), however they are consistent with ER studies involving military populations (Ziegler, 1994; Castro, 1993; Schloss, 1992). This is perhaps due to the uniqueness of the military population, which is generally younger than society as a whole. While retirees are included in most military population studies, they do not appear to constitute a large proportion of those using the ER. The age group that made up the largest group of ER users, 18 to 35 years old, is congruous with previous research in both the military and civilian settings.

Proximity to the ER and its influence on utilization is difficult to determine in this study. The density of the population treated at RACH happens to be found in the zip codes that account for 67.9 (pre-TRICARE) and 69.5 percent (post-TRICARE) of all ER

visits. These two zip codes, 73503 and 73505, are also closest to the ER. The difficulty lies in determining how much influence on ER use is actually due to proximity and how much is because of the density of the eligible population in these two tracts. A more detailed analysis of the population, beyond the scope of this study, is necessary in order to make a better judgment on this variable. One interesting finding that can be made concerning these two zip codes is that in the post-TRICARE group, patients residing here are among the least acute (i.e., have a higher mean triage category) compared to patients from other zip codes. Thus, some nonurgent use may be influenced by proximity. This finding is further bolstered by the fact that each stepwise multiple regression model uses one of these zip codes in the construction of its nonurgent use model. This peculiarity of proximity is consistent with the findings of previous research (Pisarcik, 1990; Beland et al., 1990; and Buesching et al., 1985).

The significant decrease in patients arriving by ambulance is an oddity that is not easily explained by this study, nor is such a phenomenon noted in the available literature. Speculation about why this occurred centers on the changing population Reynolds is now treating as a result of TRICARE. This population is smaller, about 40,00 total compared to the 52,000 previously, and younger by virtue of severely limiting the amount of care offered to those Medicare eligible. A more youthful population is thought to be generally more healthy and require less health care, including emergency services. The RACH prevention and wellness efforts geared toward this population may also have some effect in the marked reduction of patients arriving via ambulance.

As previously noted in the literature review, the amount of time it takes to treat ER patients is becoming more and more relevant as a measure of customer satisfaction (WSJ, 1995; Hansagi et al., 1992). The results from this study show quite convincingly that the amount of time it takes for an ER patient to be seen by a provider improved significantly. This increase in service time, particularly those patients who are seen within one hour of arriving, is most likely a function of the decrease in overall ER patient volume. Because staffing levels remained constant between the two study samples, the decrease in volume as a key contributor in the service time improvement makes strong logical sense. The data also demonstrates the ER staff is doing very well at meeting the standard of treating patients within 2 hours of ER arrival. In the post-TRICARE group, 96.1 percent of the patients fell into this category. This compares quite favorably with other MTFs providing emergency services to its patients (Ziegler, 1994). Another indicator of the increase in service time is found in the gains made in total ER time. Fifty-six percent of the post-TRICARE group spent two hours or less in the ER. Considering the patient flow through the ER (Figure 1), this is a notable achievement, too.

Benchmarking is a practice that allows organizations to compare themselves with other organizations and set goals and objectives to achieve the best business practices in any measurable category (Paz and Livingston, 1996). In providing prompt emergency services to patients, Reynolds' ER could certainly serve as a benchmark for other clinics within the organization as well as organizations external to Reynolds.

The results from the two regression models are remarkable in their identical ability to account for about 23 percent of the variance associate with nonurgent ER use. The results are useful in determining which patients are likely to seek the ER as a means of obtaining nonurgent care. For the post-TRICARE group, the regression results provide this profile of a typical nonurgent user: a patient arriving via privately owned vehicle (POV) who is younger than 56; whose beneficiary status is not 'civilian/other'; is not a warrant officer/sponsor of a warrant officer (active or retired); arriving between 23:01 and 07:00 hours, yet still seen within one hour of arriving; who presents complaining of nausea/vomiting, a lower extremity injury or illness, or 'other' complaints; not complaining of chest pain or head pain/injury; and residing in zip code 73503. This may help the staff in identifying and educating probable nonurgent users of the ER in an effort to further reduce or mitigate the behavior.

There are several limitations to this study. The inability to accurately judge and compare differences in mean triage categories between the groups, the impact of the minor care clinic (ER fast track), and the generalizability of the findings are all limiting factors that should be addressed.

An original intent of the study was to compare the acuity level, based on mean triage category, of ER patients in both groups. The change in the triage algorithm makes this goal more complex to achieve. The complication lies in determining how much change occurred as a result of TRICARE and how much of the change is actually attributable to the triage algorithm change. Even after norming the data as much as possible, the disparity between the mean triage categories for each variable, pre- and post-TRICARE,

is quite apparent. The study design does not allow for the overall quantified changes to be partitioned between TRICARE and the change in the triage algorithm. Definitive, conclusive, quantifiable judgments are consequently difficult to make. A future study employing an identical research design, and using the same triage algorithm for both groups, would serve as a useful effort that builds upon this study.

The study should have considered more fully the impact of the Minor Care Clinic on the ER operation. The two health care settings are adjacent to one another and function almost as one. Occurrences that affect one operation have an effect on the other. For this reason, the study should have also incorporated records and triage documents from the Minor Care Clinic in the construction of the data set. Future studies involving the ER should always include the Minor Care Clinic in the collection and analyzing of any research data.

The ability to generalize the study findings beyond RACH is somewhat limited. The data collected in this study represents a total of 18 days of patient visits to the ER of a military hospital serving a unique patient population. Direct links and applications to other findings in the body of literature concerning ER utilization is consequently restricted. It must also be recognized that the post-TRICARE study period is less than six months from the actual implementation date and is therefore not a very mature TRICARE environment.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purpose of this study was to determine if ER utilization changed in a TRICARE

environment and to determine the magnitude and direction of such change. Additionally, the study sought to determine if nonurgent use was a function of twelve independent variables and if nonurgent use could be predicted. In achieving the stated purpose, the study was successful as a research effort.

The results of this study provide the organization and the managers of the ER with additional information concerning the operation of this important entry to our health care system. The more data derived and information gathered concerning this service allows leaders and mangers to make better and well-reasoned decisions regarding the ER. Additionally, empirical data concerning the effect TRICARE has on the ER is available to other MTFs who implement TRICARE in the near future. This data may serve as a reference for comparison of some of the changes other MTFs are likely to experience as a result of TRICARE.

The study provides conclusive evidence that patient volume in the ER decreased significantly in a TRICARE environment. This affords managers the opportunity to review staffing levels in the ER and perhaps shift some resources commensurate with the volume decrease.

The RACH experience also demonstrates that nonurgent use of the ER can be reduced and controlled. How patients are triaged is clearly a critical feature of current patient classification system (category 1, 2, or 3). In the post-TRICARE environment, the ER staff is engaged in treating mostly emergent and urgent patients. This is precisely the role and function it was designed to perform. Some increased staff satisfaction can result from this situation.

The study shows that nonurgent use can, to a certain extent, be predicted among the beneficiary population. The stepwise multiple regression results provide a very definitive profile as to who is likely to use the ER for nonurgent conditions.

Recommendations

The ER should continue to monitor and measure its use in terms of overall volume and the proportions of emergent, urgent, and nonurgent patients. This allows for observations of trends over time, a practice central to any management improvement initiative. On a broader scale, this practice of measuring and assessing patient use should include all clinics and health care delivery operations at RACH. The study design used in this research is simple enough to replicate in any setting and as such could effectively serve as a template for on-going analysis efforts.

A careful review of the ER staffing level should be made at the one year anniversary of TRICARE implementation. This will allow sufficient time for the managed care environment of TRICARE to mature and become the recognized and accepted model of health care delivery. If the decrease in patient volume remains constant, it may be wise to shift resources to other health care delivery operations within the MTF. The acuity level of ER patients and the ability of the staff to provide prompt treatment must be kept in mind when considering any changes to the ER staffing level.

The policy of treating Prime-enrolled category 3 patients before non-Prime category 3 patients should continue. This has the potential to contribute to reduced nonurgent use of the ER and does not appear to harm patients in any manner. Additionally, the effect

this policy can have on increasing TRICARE Prime enrollment is also beneficial to Reynolds.

Patient education and marketing efforts regarding TRICARE, Prime enrollment, and ER use should continue. A particular concern should be during the peak reassignment period of the summer when many newcomers to Fort Sill will require TRICARE indoctrination. Getting active duty family members enrolled in Prime can increase their access to primary care and reduce ER use as well as nonurgent use of this critical asset.

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